SPONTANEOUS IGNITION OF HAY

A radio talk by Dr. Henry G. Knight, Chief Bureau of Chemistry and Soils, United States Department of Agriculture, broadcast in the Farm Forum period of Station WGY, Schenectady, New York, Friday, August 21, 1936.

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Thank you, Mr. Markham--------and good evening, friends!

My message tonight is on the spontaneous ignition of hay. Hay is one of the most important farm crops in the United States. It's a crop that affects the pocketbooks of dairymen and stockmen all over the world, and one that is worth millions of dollars to the farmers of the WGY territory.

But there's one thing about hay that nobody seems to thoroughly understand, and that is: "Why will hay heat under certain conditions until it actually catches fire?" The spontaneous heating of stored hay has aroused the interest of man as far back as we have any record. It troubled the cave dweller when he tried to store grass in his cave. It was the cause of fires on ships at sea during the Colonial period. And it is still the cause of fires when hay is improperly cured and stored.

It is conservatively estimated that fires caused by the spontaneous ignition of hay cause a direct loss of more than 20 million dollars a year in this country alone. There is an additional loss of about 40 million dollars a year caused by heating that reduces the feeding value but does not heat the hay to the burning point. Altogether there is a loss from spontaneous heating and ignition of hay of something like 60 million dollars on a crop that has an average farm value of about 635 million dollars a year.

Naturally, the Department of Agriculture is interested in any problem that costs the farmers of the country as much as the spontaneous ignition of hay does. It is our duty to investigate such troubles, and we do it if we have the funds for the necessary research. The Chemical Engineering Division of the Bureau of Chemistry and Soils has, for a number of years, been working on the causes of the spontaneous heating and ignition of hay, and it is my pleasure to report to you tonight on the progress that has been made thus far.

Our studies on this problem are divided into two parts. One part is a study of the records of farm fires due to the spontaneous ignition of hay. The other is experiments on hay in storage to try to find out the effects of moisture content, amount of hay stored, and methods of curing, storing, and ventilating on spontaneous heating and ignition.

Here are the records of the fires. We got detailed information on a total of 55 hay fires in one year, that were due to the spontaneous ignition of hay. A little more than eight-tenths of these fires occurred in June, July and August. Those are the main hay-harvesting months, and the fact that 82 percent of the fires occurred during these months indi-

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cates that the greatest hazard is during the first few weeks following storage of freshly cured hay. Further proof of this is contained in the record on the number of days from the time the hay was put into storage until the fire broke out. The shortest time was a few days after the hay was stored, the longest time 105 days, and the average 40 days.

Now for the results of our experiments on stored hay. The results of these investigations show that hay is very apt to heat excessively if the moisture content of the hay is much above 30 percent when it is stored. Thirty percent seems to be about the deadline for hay as normally stored. Anything above that appears to be dangerous. It is naturally safer to have the moisture content below 30 percent at the time of storage if that is possible. Our investigations indicate that the safe moisture range for the storage of long alfalfa hay, consistent with the production of good quality is 25 to 30 percent.

Clover, alfalfa, and similar kinds of hay have heavy stems that retain considerable moisture after the thinner leaves are dry. The fire danger from such hay is increased when the haying season is rainy, rendering proper curing difficult. It is interesting to note that clover or alfalfa, either alone or in combination with other hays, was involved in the majority of fires reported to us. Our investigations indicate that the same amount of moisture will cause alfalfa to heat more than red clover. If there is a heavy dew, or rain, during the night it is better to wait an hour or so in the morning until the hay is thoroughly dry. It may be more economical in the end to leave a load of damphay in the field rather than run the risk of losing a valuable barn by fire. These are things that each farmer has to decide for himself at the time the hay is being stored.

The method of storing hay is important also. Other things being equal, the best method of storing is the one that provides plenty of air. For example, hay seldom heats when it is properly stacked outdoors where there is ample ventilation, but there is danger of heating when large quantities of hay are packed into a mow that is poorly ventilated. Doors, windows, and other ventilating devices should be opened when the hay is put in the barn and should remain open until the normal heat generated by curing hay has subsided. This may require a few days or several weeks, depending on the amount of hay.

Greater ventilation than that provided by ordinary doors and windows may be obtained by special devices, such as a slatted false bottom about 8 inches above the barn floor, built-in chutes of slatted construction placed upright in the mow through which a natural current of air would flow, and slatted partitions that divide the mow into compartments.

The addition of salt to undercured hay as it is placed in storage, to prevent spontaneous ignition, is a common practice in some parts of the country. The quantity used is generally about 10 pounds of salt per ton of hay. But on the basis of the limited work done by the Bureau of Chemistry and Soils we consider the use of salt in amounts safe for feeding to be an open question which can be settled only by further investiga-

tion. Too much reliance should not be placed on salt. It is not a substitute for adequate curing of hay in the field.

In regard to the amount of hay stored, we have found that the larger the mass the greater the danger from heating and fire. There doesn't seem to be much danger from heating in small quantities of hay, of say 10 or 12 tons and less.

A simple way to find out whether your hay is heating is to drive a three-quarter-inch pipe down through the hay and lower a thermometer on a string through the pipe. Stop the thermometer at different positions in the pipe and leave it at each place about 20 minutes before reading. It requires a temperature of about 400 degrees Fahrenheit to cause hay to take fire and burn, but it will be damaged at temperatures much lower than that.

That's about all I have time for tonight. I haven't gone into the technical end of this problem, because the radio is not the place for that. I have merely given you a few of the high lights from the results of our investigations which are being continued. In conclusion I'll summarize a few precautions that are yielding dividends for those farmers who are putting them into practice.

1. Cure hay uniformly so the moisture content will be below 30 percent.
2. Don't store wet or damp hay. Let it dry first.
3. Provide all possible ventilation when more than 10 tons of hay are stored in a mass.
4. A leaky roof may cause a fire in hay that was in perfect condition when it was stored.
5. If you have to remove heating hay from a barn to prevent a fire, call the local fire department before starting. Heating areas should be thoroughly wetted with water before being taken out; otherwise these hot pockets may burst into flame when exposed to the air. The hay when removed should be placed in a field at a safe distance from buildings.

If you want more information on this complex problem of the spontaneous heating and ignition of hay, write the Bureau of Chemistry and Soils, Washington, D. C., and we'll give you all the help we can.

I'm glad to have had the opportunity of talking with you people in this part of the country. I always enjoy my visits up here, and I hope you'll return the courtesy by calling on us when you are in Washington.

Thank you, and good night.

ANNOUNCER: Thank you, Dr. Knight. We are always glad to have you with us. If you listeners want additional information on the spontaneous heating and ignition of hay just address your request to Dr. Knight, Station WGY, Schenectady, N. Y., and we'll see that it eaches him.

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